

**WHAT IS CLAIMED IS:**

1. A vector-controlled, dual inverter system for a three-phase induction motor, comprising:

a first inverter system adapted to be coupled to one end of three-phase  
5 windings of a stator and configured to compensate back electromotive force; and  
a second inverter system adapted to be coupled to the other end of the  
three-phase windings of the stator and configured to compensate reactive power.

2. The vector-controlled, dual inverter system of claim 1, wherein the first inverter  
10 system interconnects a battery and a three-phase induction motor, and the second  
inverter system interconnects a capacitor and the three-phase induction motor.

3. The vector-controlled, dual inverter system of claim 2,  
wherein the first inverter system comprises:

15 a q-axis current controller configured to provide proportional integral control  
based on a difference between a q-axis current command and a q-axis current,  
compensating back EMF, and generating a first q-axis voltage command;

a magnetic flux controller configured to provide proportional integral control  
based on a difference between a magnetic flux command and magnetic flux, and  
20 generating a d-axis current command;

a d-axis current controller configured to provide proportional integral control  
based on the difference between the d-axis current command and the d-axis current, and  
generating a first-d axis voltage command;

25 a first d-q/three-phase coordinate converter adapted to receive the first q-axis  
voltage command and the first d-axis voltage command, and configured to convert the  
first q-axis voltage command and the first d-axis voltage command to a first three-phase  
voltage command;

a first inverter configured to convert Direct Current (D.C.) power to  
Alternating Current (A.C.) power based on the first three-phase voltage command to the

three-phase induction motor; and

a first three-phase/d-q coordinate converter configured to detect the three-phase currents flowing from the first inverter to the three-phase induction motor and converting the three-phase currents to a q-axis current and a d-axis current,

5 wherein the second inverter system comprises:

a voltage controller configured to provide proportional integral control based on a difference between a DC-link capacitor voltage command and a DC-link capacitor voltage to estimate a voltage command vector and dividing the voltage command vector into a d-axis component and a q-axis component;

10 a reactive voltage compensator compensating a d-axis component and a q-axis component and providing a second d-axis voltage command and a second q-axis voltage command;

a second d-q/three-phase coordinate converter receiving the second q- axis voltage command and the second d-axis voltage command and converting them to a second three-phase voltage command; and

15 a second inverter converting D.C. power to A.C. power based on the second three-phase voltage command to the three-phase induction motor.

4. The system of claim 3, wherein the back EMF compensation is performed  
20 based on the equation described below:

$$\text{Compensation voltage for back EMF} = w_e \frac{L_m}{L_r} \lambda_{dr}^e$$

wherein  $w_e$  : angular velocity of the rotor

$L_m$  : mutual inductance

$L_r$  : rotor inductance

25  $\lambda_{dr}^e$  : magnetic flux of rotor

5. The system of claim 3, wherein the second d-axis voltage command and the

second q-axis voltage command provided by the reactive voltage compensator are determined based on the equations described below:

$$v_{ds2}^{e*} = \frac{i_{ds}^e}{\|i_s\|} \left( k_{vp} + \frac{k_{iv}}{s} \right) (v_{dc2}^* - v_{dc2}) + \omega_e \sigma L_s i_{qs}^e$$

$$v_{qs2}^{e*} = \frac{i_{qs}^e}{\|i_s\|} \left( k_{vp} + \frac{k_{iv}}{s} \right) (v_{dc2}^* - v_{dc2}) - \omega_e \sigma L_s i_{ds}^e$$

wherein  $v_{ds2}^{e*}$  : second d-axis voltage command value

5  $v_{qs2}^{e*}$  : second q-axis voltage command value

$i_{ds}^e$  : d-axis current command

$i_{qs}^e$  : q-axis current command

$v_{dc2}^*$  : DC-link capacitor voltage command

$v_{dc2}$  : DC-link capacitor voltage

10  $k_{vp}$  : proportional control gain

$k_{vi}$  : integral control gain

$i_s$  : stator current

$\omega_e$  : angular velocity of the rotor

$\sigma L_s$  : leakage inductance